

Amendment After Final Rejection  
U.S. Patent Application No. 09/711,126

a) introducing at least one cellulytic enzyme composition and at least one cationic polymer composition to a paper making pulp within 5 minutes of each other to form a treated pulp; and

b) forming the treated pulp into paper or paperboard.

Please cancel claims 15 and 16 without disclaimer or prejudice of the subject matter set forth therein.

**REMARKS**

Reconsideration and continued examination of the above-identified application are respectfully requested.

The amendment to the claim further defines what the applicants regard as their invention. Full support for the amendment can be found throughout the present application, for instance, at page 4, lines 4-8. Accordingly, no question of new matter should arise, and entry of the amendment is respectfully requested.

The applicants and the undersigned appreciate the telephone conversation with Examiner Alvo on December 17, 2002. In the telephone interview, the rejection set forth in the Final Office Action and the differences between the claims of the present invention and the cited art relied upon by the Examiner were discussed. The substance of the telephone interview is set forth in the remarks below.

At page 2 of the Office Action, the Examiner rejects claims 1, 3, 4, 6, 7, 13, and 15-24 under 35 U.S.C. §103(a) as being unpatentable over EP 433 258 with or without Jaquess (U.S. Patent No. 5,356,800). The Examiner asserts that EP 433 258 teaches adding oxidizing enzymes at about the same time that a cationic polymer is added to the pulp. The Examiner asserts that the laccase of EP 433 258 does not differ from the enzyme used by the applicant. The Examiner then

Amendment After Final Rejection  
U.S. Patent Application No. 09/711,126

refers to Jaquess, and asserts that Jaquess indicates the use of the laccase and peroxidase as the enzyme. The Examiner then concludes that the laccase and peroxidase of EP 433 258 do not differ from the instant enzyme. For the following reasons, this rejection is respectfully traversed.

EP 433 258 relates to the production of mechanical pulp from a fibrous product, wherein the fibrous product is subjected to a chemical and/or enzymatic treatment in which a binding agent is linked with the lignin in a fibrous product. The bond between the binding agent and the fiber is created either by using oxidizing enzymes or oxidizing chemical producing radicals. According to EP 433 258, one of the enzymes that can be used as part of pulp production is laccase. In one example in EP 433 258, starch was added to a pulp in an amount of 5% and the pulp was stirred. Laccase was then diluted with water and added to the pulp mixture in an amount of 0.1% of the amount of pulp mixture.

However, EP 433 258 does not indicate any particular length or amount of time with respect to the introduction of the cationic starch and the use of the enzymatic treatment. Thus, EP 433 258 does not teach or suggest the amount of time that expires between the introduction of the cationic starch and the introduction of the laccase. More specifically, EP 433258 does not teach or suggest introducing at least one cellulytic enzyme composition and at least one cationic polymer composition to a paper making pulp within 5 minutes of each other to form a treated pulp. It would be unfair for the Examiner to assume that the starch and enzyme are added “within 5 minutes of each other” when the amount of time is not described in EP 433 258. Claim 1 of the present application clearly recites this limitation.

In EP 433 258, the addition of a starch to the pulp, stirring it properly, and then adding an enzyme such as laccase, does not constitute, to one skilled in the art, adding cellulytic enzyme and a cationic polymer at “within 5 minutes of each other.”

Amendment After Final Rejection  
U.S. Patent Application No. 09/711,126

Also, EP 433 258 does not teach or suggest using enzymes in an amount of from about 0.100% to about 0.001% based on the dry weight of the pulp, as recited in claim 4 of the present application. Moreover, EP 433 258 does not teach or suggest pre-combining the cationic polymer and the enzyme or simultaneously adding the cationic polymer and the enzyme, as recited in claims 13 and 18 of the present application respectively. Also, EP 433 258 does not teach or suggest using at least one cationic polymer having at least one nitrogen-containing polymer.

Jaquess does not overcome any of the serious deficiencies of the primary reference since it relates to stabilizing a formulation capable of enhancing the storage and shelf life of liquid enzymatic compositions as well as acting as a dispersant aid for industrial-processed water. Jaquess does not teach or suggest using cellulytic enzyme and at least one cationic polymer within 5 minutes of each other to form a treated pulp. Claim 7 is dependent on claim 2. Claim 2 is not rejected over EP 433 258 with or without Jaquess, as such claim 7 is patentable. Accordingly, the rejection under 35 U.S.C. §103(a) over EP 433 258 with or without Jaquess should be withdrawn.

At page 2 of the Office Action, the Examiner rejects claims 1, 3, 4, 6, 8-11, 13, 15-22, 24, 31-36, 38, 39, 41, and 42 under 35 U.S.C. §103(a) as being unpatentable over Sarkar et al. (U.S. Patent No. 5,169,497) with or without Sarkar et al. (U.S. Patent No. 5,507,914). The Examiner asserts that Sarkar et al. '497 teaches treating all types of paper pulp with cellulolytic enzymes and cationic polymers. According to the Examiner, Table 1 in Sarkar et al. '497 uses enzyme treatment times of 10 to 60 minutes that read on "about the same time" in the claims of the present application. The Examiner also asserts that Sarkar et al. '497 indicates that the enzyme should react with the pulp for 10 minutes. The Examiner asserts that Sarkar et al. '497 does not indicate that a cationic polymer should not be added during the enzyme reaction. Therefore, according to the Examiner, it would have been especially obvious to add the enzyme and polymer at a time shorter

Amendment After Final Rejection  
U.S. Patent Application No. 09/711,126

than 10 minutes.

The Examiner then indicates that Sarkar et al. '497, like Sarkar et al. '914, teaches that both the polymer and the enzyme could be added at multiple addition points throughout the paper-making process. The Examiner also indicates that Sarkar et al. '497, like Sarkar et al. '914, teaches that the enzyme can be added at any chest prior to the refiner and in the machine chest, and that this is the same point where the cationic polymer is added. According to the Examiner, no criticality has been shown for adding the additives less than 10 minutes apart, e.g. simultaneously. The Examiner also specifically refers to claims 3 and 5 of Sarkar et al. '914 for a list of equivalent cationic polymers that can be used in the process. The Examiner concludes that it would have been obvious to add different, but equivalent, cationic polymers in each of the multiple feed points taught by Sarkar et al. '914. For the following reasons, this rejection is respectfully traversed.

With respect to Sarkar et al. '497, this patent relates to improving freeness of paper pulp that includes adding to the pulp a cellulolytic enzyme, and allowing the pulp to contact the cellulolytic enzyme for at least 20 minutes. According to column 3 of Sarkar et al. '497, the invention requires that the pulp first be treated with the enzyme and then with the cationic polymer. Furthermore, Sarkar et al. '497, in column 3, indicates that the minimum treating time of the pulp with an enzyme is about 20 minutes. As seen in Table 1 of Sarkar et al. '497, the CSF values vary depending on the enzyme treatment time. Thus, Sarkar et al. '497 clearly mandates that there be a waiting time of at least 20 minutes between the introduction of the cationic polymer and after the introduction of the enzyme. At least 20 minutes is not "within 5 minutes."

With regard to the Examiner's comment that no "criticality" has been shown with respect to adding the additives less than 10 minutes apart, the applicants and the undersigned respectfully point out to the Examiner that criticality is not a standard for patentability. The standard for

Amendment After Final Rejection  
U.S. Patent Application No. 09/711,126

patentability is whether the claimed invention is taught or suggested by the references applied by the Examiner. As the Examiner admits, each Sarkar et al. reference shows a delay in the treating time with the enzyme cationic polymer. Since 20 minutes is not "within 5 minutes" and is not even close to "within 5 minutes," it is clear that Sarkar et al. does not teach or suggest the claimed invention. Criticality is not the issue with respect to this determination. Further, claims 17 and 18, which recited times less than 5 minutes are also different from the Examiner's interpretation of Sakar et al. Accordingly, it is clear that the Sarkar et al. patents do not teach or suggest the claimed invention.

With respect to the Examiner's reliance on Table 1 of Sarkar et al. '497, Table 1 does make references to 10 minutes. However, "10 minutes" is not the same as "within 5 minutes." It is double the time. In fact, one skilled in the art by reading Table 1 would see that a reduced reaction time results in a lower CSF value. For example, according to Table 1, at column 4, lines 39, 40, and 43, polymer 2 with enzyme 1 at a pH of 6, at 40 °C, and at a reaction time of 10 minutes results in a CSF value of 506.63; however, the same composition at the same temperature, but at a reaction time of 35 minutes results in a CSF value of 601.0 and at a reaction time of 85 minutes results in a CSF value of 622.60. Therefore, one skilled in the art by reading Sarkar et al. and especially Table 1 of Sarkar et al. would conclude that a reaction time of greater than 20 minutes is required and that a reaction time of less than 10 minutes would result in an unsuccessful reaction. As such, Sarkar et al. clearly teaches away from going below 20 minutes, and certainly based on the poor results, one skilled in the art would clearly not go below 10 minutes.

Additionally, no mention is made in Sarkar et al. '497 of pre-combining a cationic polymer and an enzyme or simultaneously adding at least one cellulytic enzyme composition and at least one cationic polymer to the pulp as recited in claims 13 and 18 of the present application respectively.

Amendment After Final Rejection  
U.S. Patent Application No. 09/711,126

Instead, column 3 of Sarkar et al. '497 requires that the pulp first be treated with the enzyme and then with the cationic polymer. Furthermore, no mention is made in Sarkar et al. '497 of using a nitrogen-containing polymer or a cationic starch as recited in claims 22, 33, and 34 of the present application.

Additionally, Sarkar et al. '497 does not teach or suggest first introducing a cationic polymer composition to the pulp and then introducing at least one cellulytic enzyme to form the pulp into paper, as recited in claim 31 of the present application. Instead, column 3 of Sarkar et al. '497 requires that the pulp first be treated with the enzyme, for a minimum treating time of about 20 minutes, and then with the cationic polymer. Because addition of the synthetic polymer effects the enzymatic reaction of the pulp by not allowing the enzyme to properly react with the pulp, one having skill in the art would not add the cationic polymer during the enzymatic reaction for a time shorter than 20 minutes. Thus, for reasons set forth above, Sarkar et al. '497 clearly teaches away from claims 1 and 31 and the claims dependent thereon.

With respect to Sarkar et al. '914, this patent is very similar to Sarkar et al. '497 in that the purpose of the invention is to enhance the freeness of paper pulp. Sarkar et al. '914 further requires long delays between the introduction of the enzyme and the introduction of any cationic polymer. Accordingly, for these same reasons discussed above with respect to Sarkar et al. '497, Sarkar et al. '914 does not teach or suggest the claimed invention. Accordingly, the rejection under 35 U.S.C. §103(a) over Sarkar et al. '497 with or without Sarkar '914 should be withdrawn.

At page 3 of the Office Action, the Examiner rejects claims 2, 7, 12, and 23 under 35 U.S.C. §103(a) as being unpatentable over Sarkar et al. '497 with or without Sarkar et al. '914 as applied to claim 1 and further in view of EP 433 258. The Examiner asserts that EP 433 258 teaches that adding cationic starch or paper pulp during enzymatic treatment increases the strength of the paper.

Amendment After Final Rejection  
U.S. Patent Application No. 09/711,126

Therefore, according to the Examiner, it would have been obvious to add the cationic starch to the pulp of Sarkar et al. '497 to increase the paper strength as taught by EP 433 258. The Examiner also asserts that it would have been obvious to add the starch at various addition points in the same manner as the cationic starch and the enzyme in Sarkar et al. '914. For the following reasons, this rejection is respectfully traversed.

With respect to claims 2, 7, 12, and 23, these claims are dependent directly or indirectly on claim 1. As such, the reasons set forth above with respect to the patentability of claim 1 would also apply here. In addition, the Examiner has not explained how one skilled in the art could easily adapt the particular teachings set forth in EP 433 258 into either one of the Sarkar et al. patents. Sarkar et al., in each patent, clearly requires a long delay time between the introduction of enzyme and the cationic polymer. Thus, any introduction of a cationic starch as shown in EP 433 258 would require a long delay if used in Sarkar et al.

With respect to the Examiner's argument that it is obvious to add starch at various addition points, the Examiner provides no support for this conclusion. In addition, EP 433 258 clearly indicates that the starch is added prior to the enzyme. This is the opposite to the teaching of Sarkar et al. patents and thus would not make sense if the teaching of EP 433 258 were applied to Sarkar et al. Accordingly, the combination of EP 433 258 with Sarkar et al. is not possible. As such, for the reasons set forth above, claims 2, 7, 12, and 23 are patentable. Accordingly, the rejection under 35 U.S.C. §103(a) over Sarkar et al. '497 with or without Sarkar et al. '914 in view of EP 433 258 should be withdrawn.

The Examiner, at page 4 of the Office Action, rejects claims 5 and 37 under 35 U.S.C. §103(a) as being unpatentable over Sarkar et al. '497 with or without Sarkar et al. '914 as applied to claim 1, and further in view of WO 99/43780. The Examiner asserts that WO 99/43780 teaches

Amendment After Final Rejection  
U.S. Patent Application No. 09/711,126

stabilizing the enzymes during pulp treatment by using the enzymes in combination with a polyamide oligomer. Therefore, the Examiner asserts that it would have been obvious to add the polyamide oligomer of WO 99/43780 to stabilize the enzymes of Sarkar et al. '497. For the following reasons, this rejection is respectfully traversed.

WO 99/43780 relates to improving the shelf life stability of enzymes by using polyamide oligomers. The reference does not cure any of the deficiencies of Sarkar et al. Claims 5 and 37 are dependent directly on claims 1 and 31. Therefore, the reasons set forth above with respect to the patentability of claims 1 and 31 would also apply here. Accordingly, the rejection under 35 U.S.C. §103(a) over Sarkar et al. '497 with or without Sarkar et al. '914 in view of WO 99/43780 should be withdrawn.

If there are any remaining questions, the Examiner is encouraged to contact the undersigned by telephone.

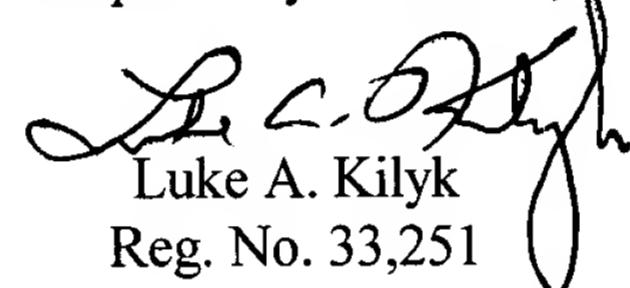
Amendment After Final Rejection  
U.S. Patent Application No. 09/711,126

**CONCLUSION**

In view of the following remarks, the applicants respectfully request consideration of this application and the timely allowance of the pending claims.

If there are any other fees due in connection with the filing of this response, please charge the fees to Deposit Account No. 50-0925. If a fee is required for an extension of time under 37 C.F.R. § 1.136 not accounted for above, such extension is requested and should also be charged to said Deposit Account.

Respectfully submitted,



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**VERSION WITH MARKINGS TO SHOW CHANGES MADE**

1. (Amended) A method of making paper or paperboard comprising:
  - a) introducing at least one cellulytic enzyme composition and at least one cationic polymer composition to a paper making pulp within 5 minutes of each other [at about the same time] to form a treated pulp; and
  - b) forming the treated pulp into paper or paperboard.